

# Ch 2 Atoms Molecules Ions

Probe kids to Remember Early names concepts

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Chemistry present since Before 1000 BC  
metallurgy for making ornaments/weapons  
embalming fluid

Greeks first to try + Explain (philosophically)

460-370 BC

Democritus - coined term atom

also Leucippus

indivisible particle

Aristotle 4 elements

2000

Alchemy ~ 2000 years metal  $\rightarrow$  gold  
but some elements discovered  
acid preparation too.

16th Century Foundations of Modern Chemistry laid

Georg Bauer - systematically <sup>refined</sup> ~~refined~~ ores  
(1494-1555) extract minerals

Paracelsus - used minerals for medicinal  
(1493-1541) purposes

Robert Boyle - first person to perform truly quantitative experiments  
(1627 - 1691)

### P vs. V

Theorized sub was an element unless it could be broken & further into simpler subs (called 4 elements)

(Although he still believed in alchemy changing metals into others)

Combustion gave dilemma

George Stahl - suggested "phlogiston" flowed out of burning material and when air became saturated w/it in a closed container Comb. stopped  
(1660 - 1734)

Joseph Priestly - discovered  $O_2$  gas and found to <sup>support vigorous</sup> ~~support~~ combustion. Called "dephlogisticated air" isolated by heating  $HgO$   
(1733 - 1804)  
(made seltzer)

2.2 Lavoisier - proved  $O_2$  needed to promote combustion  
(1743 - 1794) (show video of soap bubbles igniting)

Very quantitative  $\rightarrow$  showed LCM

Published first chemistry text in 1789

beheaded in French Revolution b/c he was a tax collector

Now quantitation dominated

Joseph Proust show law of definite composition } Multiple name for  
(1754-1826) LDC "proportion" Law's Be careful

given sample of a comp always contains  
same prop<sup>ty</sup> of elements by mass no matter size or source.

John Dalton - Thought of LCM, LDC proposed ~~atomic theory~~ <sup>atomic theory</sup>, Law of Multiple Prop  
(1766-1844) LMP  $\hookrightarrow$  2 comp of C + O

	C	O	
A	1g	1.33g	} different Props
B	1g	2.66g	

LMP - when 2 elements form a series of comps the ratios of  
the elements exist as small whole #'s

Give examples  $N_2O, NO_2, NO$

2.3 This lead to overall statement of atomic theory (1808)

Review/Give 5 pts

1. each element made of ~~part~~ atoms
2. atoms cannot be subdiv. ~~create destr.~~
3. atoms same element ID diff not
4. Comps form w/ atoms <sup>of diff elements</sup> combine (LDC kinds)
5. Chem rxn involve Reorganization of <sup>atoms</sup> matter
- 6.

Dalton not w/o faults pg 44 - 45



Last name Jön Jakob Berzelius - provided and worked to accurately measure atomic mass of elements

also gave symbols to many elements discover Se, Si

## 2.4 Experiments to Characterize the atom

JJ Thomson - used CRT  
Crookes tube

Show video

Stream of neg particles - electrons

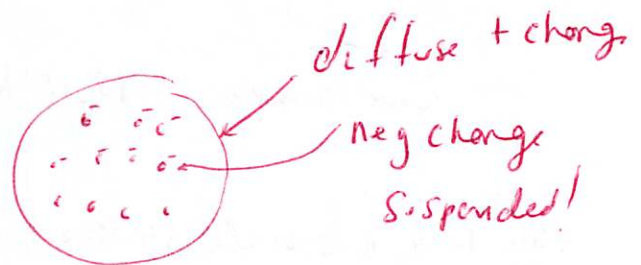
Based on deflections did get Charge/mass Ratio

$$\frac{e}{m} = -1.76 \times 10^8 \frac{C}{g}$$

Since  $e^-$  could be produced from any metal electrode  
all elements contain  $e^-$  and some + charge to balance

Charge

Proposed "plum pudding" model



1909 Robert Millikan - oil drop

show animation

able to find charge of  $e^-$  thus mass

$$1.6 \times 10^{-19} \text{ C}$$

$$9.11 \times 10^{-31} \text{ kg}$$

1911 Rutherford

↳ Gold foil Exp

Testing penetrative power of  $\alpha$  particles  
and Thomson's model (should pass through)

Show video of what happened.

Explain  
Becquerel 1896  
3 <sup>emission</sup> ~~particles~~

deduced what  $\rightarrow$  atom mostly open space

atom center dense + charge - nucleus

$e^-$  orbit like planets — pc of nuclear material  
weigh 250 million tons

2.5 Atomic Xture Simple!

Atom Made of nucleus -  $10^{-13}$  cm dia.

$e^-$  cloud -  $\sim 10^{-8}$  cm away from nucleus

3 particles of atoms

$$e^- \quad 9.11 \times 10^{-31} \text{ kg}$$

$$p \quad 1.67 \times 10^{-27} \text{ kg}$$

$$n \quad 1.67 \times 10^{-27} \text{ kg}$$

$\left. \begin{array}{l} 1- \\ 1+ \end{array} \right\} \text{ - Relative}$   
 $-$

atomic # ( $Z$ )

mass # ( $A$ )

$A$   
 $Z$

Symbol  
notation

Know how  
to count  $p, n, e^-$   
Symbol not. etc.

define isotopes - hyphen notation

## 2.6 Molecules + Ions

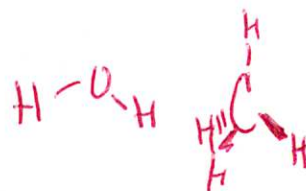
Chemical bonds - forces that hold atoms together

Covalent Bonds - sharing  $e^-$

smallest unit a molecule - can exist independently

Rep by chemical formula - symbols + numeric subscripts  $H_2O$   $CH_4$   
 + Rep ~~examples~~ comp.

Structural formula lines for bonds



## Ionic Comps

↳ made of ions

Ion-charged atom or group of atoms

Cation - (+)

Anion - (-)

Ionic bonding - attraction of oppositely charged ions

Ionic solid or salt

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## 2.7 Periodic Table who designed 1<sup>st</sup> table?

Go over atomic # mass #

Metals → props are  
Form + ions (lose  $e^-$ )

nonmetals → gain  $e^-$

bond via covalent Bonds  $Cl_2$

go over

major groups - sections alkali  
alkaline earth

group vs period.

# Naming Compounds

Ions

## Binary Comps

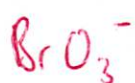
Name cation      Name anion

↑  
If more than 1 charge  
use Roman numeral for charge  
or old name

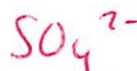
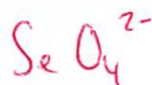
↑ -ide suffix  
either  
polyatomic  
or monatomic

See Flow  
Charts in  
Book

Bromate like Chlorate



Selenate like Sulfate



Covalent Binary Comps  
Method 1 use <sup>numeric</sup> prefixes

Naming Acids

Binary / oxyacids

## Ch 2 Hmwk

p69 Q 2, 4, 11

Pres

72 Q 53, 56, 58, 59, 64, 65, 6

70 Q 18, 22, 26, 27, (30), (31), 34

73 Q 69, 78

71 Q 44, 46, 47, 51